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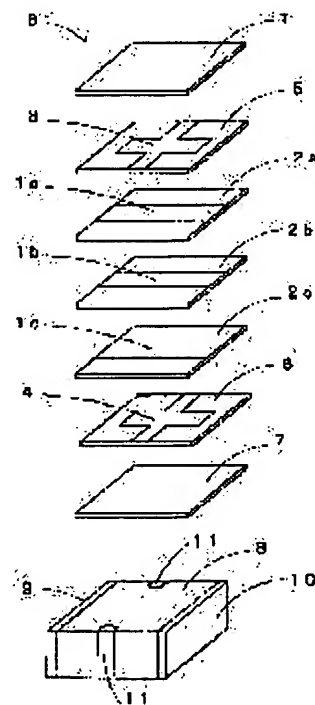
(72)Inventor : AZUMA TAKAHIRO
UENO HARUHIKO
TOKUDA HIROMICHI

(54) LAMINATED TYPE THROUGH CAPACITOR

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the resistance value of a through electrode as a whole by laminating at least three through electrodes between ground electrodes to overlap each other.

SOLUTION: A lamination body 8 is formed by laminating and forming three dielectric sheets 2a, 2b, 2c wherein through electrodes 1a, 1b, 1c are formed to overlap each other. Dielectric sheets 5, 6 wherein ground electrodes 3, 4 are formed are laminated in an upper side of the dielectric sheet 2a and a lower side of the dielectric sheet 2c and a dielectric sheet 7 for an outer layer is laminated in an outside thereof. Through electrodes 1a, 1b, 1c are extracted to both edge faces of the lamination body 8 and the ground electrodes 3, 4 are extracted to both side surfaces between the both edge faces. A through electrode is connected to the outside electrodes 9, 10 and the ground electrodes 3, 4 are connected to outside electrodes 11, 11. Since each through electrode is connected parallel mutually by an outside electrode, a resistance value of a through electrode as a whole can be made small.



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(71)出願人 00006231

株式会社村田製作所

京都府長岡京市天神二丁目26番10号

(72)発明者 東 貴博

京都府長岡京市天神二丁目26番10号 株式

会社村田製作所内

(72)発明者 上野 治彦

京都府長岡京市天神二丁目26番10号 株式

会社村田製作所内

(72)発明者 徳田 博道

京都府長岡京市天神二丁目26番10号 株式

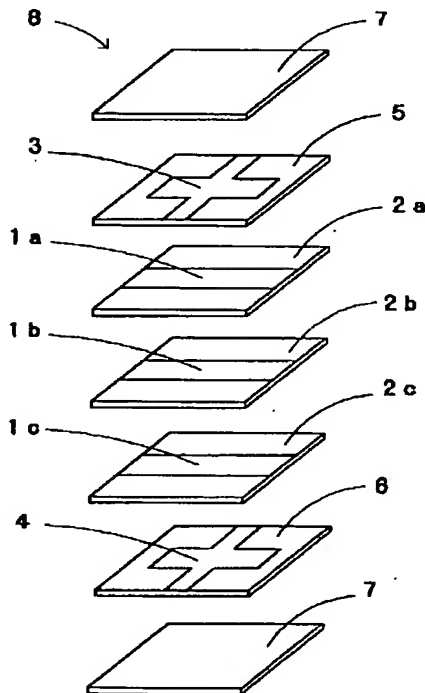
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(54)【発明の名称】 積層型貫通コンデンサ

(57)【要約】

【課題】 貫通電極の数を増やして電流容量を大きくできると共に、静電容量が大きくなりえない貫通型積層コンデンサを提供することを目的とする。

【解決手段】 貫通電極と、この貫通電極の上側および下側に積層されたアース電極とを内部に有し、かつ、両端に前記貫通電極が引き出され、その両端の間の側面に前記アース電極が引き出された積層体と、前記積層体の両端面および側面に引き出された前記貫通電極および前記アース電極のそれぞれとに接続して形成された複数の外部電極とからなる積層型貫通コンデンサにおいて、前記貫通電極は、前記アース電極の間に少なくとも3個が重なり合うようにして積層されていることを特徴とする。



【特許請求の範囲】

【請求項1】 貫通電極と、この貫通電極の上側および下側に積層されたアース電極とを内部に有し、かつ、両端に前記貫通電極が引き出され、その両端の間の側面に前記アース電極が引き出された積層体と、前記積層体の両端面および側面に引き出された前記貫通電極および前記アース電極のそれぞれとに接続して形成された複数の外部電極とからなる積層型貫通コンデンサにおいて、前記貫通電極は、前記アース電極の間に少なくとも3個が重なり合うようにして積層されていることを特徴とする積層型貫通コンデンサ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、例えばノイズフィルタなどに用いられる積層型貫通コンデンサに関する。

【0002】

【従来の技術】図4および図5は、従来の積層型貫通コンデンサの一例を示す分解斜視図および斜視図である。この積層型貫通コンデンサは、積層体80と、この積層体80の外表面に形成された外部電極90、100、110とからなる。積層体80は、貫通電極10が形成された誘電体シート20と、その誘電体シート20の上側および下側に、アース電極30および40が形成された誘電体シート50および60が積層されると共に、誘電体シート50および60の外側にそれぞれ、外層用の誘電体シート70が積層されている。また、積層体80の両端面には前記貫通電極10が引き出され、その両端面の間の両側面には前記アース電極30、40が引き出されている。前記貫通電極10は外部電極90、100と、また、前記アース電極30、40は外部電極110、110とにそれぞれ接続されている。ここで、上記の貫通電極10とアース電極30、および貫通電極10とアース電極40のそれぞれの間で静電容量を形成することから、図4および図5に示す積層型貫通コンデンサは、2個の静電容量が互いに並列に接続された貫通型のノイズフィルタである。

【0003】また、上記と同様の2個の静電容量が互いに並列に接続された積層型貫通コンデンサとして、アース電極30、40の間にある貫通電極10を2層にしたものがある。これは、外部電極90、100の間に2個の貫通電極10を並列に接続させることによって、全体としての貫通電極の抵抗値を小さくして電流容量を大きくさせるためのものである。

【0004】しかしながら、このような貫通電極10の厚みは、通常、数 μm と薄く、抵抗値が高いため、これを電源ラインなどのノイズフィルタに使用して、大きな電流が流れると、貫通電極10が異常発熱したりして、積層型貫通コンデンサの電気特性が大きく変動して所望の特性から大きく外れたり、また、積層型貫通コンデン

サの本体にクラックなどが入ったりする問題があった。

【0005】

【発明が解決しようとする課題】そこで、貫通電極の数を更に増やして、全体としての貫通電極の抵抗値を小さくして電流容量を大きくすることが考えられるが、この場合、増やした貫通電極と併せて、その貫通電極との間で静電容量を形成するアース電極も増やすことになるため、静電容量も3個以上が並列に接続され、全体の静電容量が大きくなってしまふ。このような静電容量が大きい積層型貫通コンデンサは、ノイズフィルタとして高周波領域まで対応しにくくなる。

【0006】本発明は、従来の貫通型積層コンデンサにおける上記問題を解決すべくなされたものであって、貫通電極の数を増やして電流容量を大きくできると共に、静電容量が大きくならない積層型貫通コンデンサを提供することを目的とする。

【0007】

【課題を解決するため手段】本発明は、貫通電極と、この貫通電極の上側および下側に積層されたアース電極とを内部に有し、かつ、両端に前記貫通電極が引き出され、その両端の間の側面に前記アース電極が引き出された積層体と、前記積層体の両端面および側面に引き出された前記貫通電極および前記アース電極のそれぞれとに接続して形成された複数の外部電極とからなる積層型貫通コンデンサにおいて、前記貫通電極は、前記アース電極の間に少なくとも3個が重なり合うようにして積層されていることを特徴とする積層型貫通コンデンサである。この本発明によれば、アース電極の間に貫通電極が少なくとも3個、重なり合うようにして積層され、各貫通電極が外部電極で相互に並列に接続されるため、貫通電極を3個以上に増やすと、全体としての貫通電極の抵抗値をより小さくして電流容量を大きくできる。また、アース電極との間で静電容量が形成される貫通電極は、アース電極と対向する貫通電極、すなわち貫通電極の外側の2個の貫通電極だけであり、その間にある貫通電極は、静電容量の形成に寄与しない。このため、その貫通電極を3個以上に増やしても静電容量の形成に寄与しない貫通電極が増えるだけで、全体としての静電容量が増加しない。

【0008】

【発明の実施の形態】以下、本発明の実施例を図面に基づいて説明する。

【0009】図1は、本発明の積層型貫通コンデンサの一実施例に係わる分解斜視図である。図2は、本発明の積層型貫通コンデンサの外観を示す斜視図である。この実施例の積層型貫通コンデンサは、積層体8と、この積層体8の外表面に形成された外部電極9、10、11とからなる。積層体8は、貫通電極1a、1b、1cが形成された誘電体シート2a、2b、2cが3枚、重なり合うようにして積層され、その誘電体シート2aの上側

および誘電体シート2cの下側に、アース電極3および4が形成された誘電体シート5および6が積層されると共に、誘電体シート5および6の外側にそれぞれ、外層用の誘電体シート7が積層されている。また、積層体8の両端面には前記貫通電極1a、1b、1cが引き出され、その両端面の間の両側面には前記アース電極3、4が引き出されている。前記貫通電極1は外部電極9、10と、また、前記アース電極3、4は外部電極11、11とにそれぞれ接続されている。また、上記実施例は、アース電極3、4が形成された誘電体シート5、6の間に、貫通電極が形成された誘電体シートが3枚積層されたものであるが、3枚に限らず、4枚以上のものでもよく、すなわち、本発明の積層型貫通コンデンサは、アース電極3、4の間に貫通電極が少なくとも3個あればよい。

【0010】本発明は、上記のようにアース電極3、4の間に貫通電極が少なくとも3個、重なり合うようにして形成された積層型貫通コンデンサであり、各貫通電極が外部電極で相互に並列に接続されるため、全体としての貫通電極の抵抗値をより小さくして電流容量を大きくできる。また、貫通電極を3個以上に増やしても、アース電極3、4と各貫通電極の間の重なり面積が増えないため、全体としての静電容量が増加することはない。次に、本発明の積層型貫通コンデンサの効果を確認するために、貫通型積層コンデンサのサイズを寸3.2mm、W寸1.25mm、T寸0.8mmで、アース電極3、4の間に貫通電極を8個、重なり合うようにして積層した積層型貫通コンデンサを作製した。比較例として、アース電極3、4の間に前記貫通電極を2枚、重なり合うようにして積層した積層型貫通コンデンサを作製した。そして、積層型貫通コンデンサの、全体としての貫通電極の抵抗値を測定した結果、実施例では30ミリオーム、比較例では130ミリオームとなり、実施例の抵抗値は比較例に比べ約1/4に小さくなった。また、積層型貫通コンデンサの、全体としての静電容量を測定した結果、実施例では2000pF、比較例では1950pFとなり、実施例の静電容量は比較例とほぼ同じ値となった。次に、電流容量の大きさをみるため、貫通電極に電流を流して積層型貫通コンデンサの表面の温度上昇を測定した。その結果、図5の発熱特性に示すように、例えば、2アンペアの電流が流れた時の発熱上昇温度は、実施例では約28℃であったが、比較例では熱暴走してしまい、測定できなかった。この結果から、実施例では、電流容量が比較例に比べ大きくなり、大きな電

流が流れても、異常発熱を抑制できる。以上より、この実施例の積層型貫通コンデンサは、貫通電極の数を増やしても、静電容量を大きくしないで電流容量を大きくできる。

【0011】なお、詳細な説明は省略するものの、積層型貫通コンデンサの挿入損失特性を測定したところ、実施例と比較例との差が認められず、すなわち、実施例は、比較例に比べ貫通電極の数を増やしても、挿入損失特性が悪くならないことを確認した。

10 【0012】また、本発明は、上記実施例に記載した内容に限ることなく、本発明の趣旨を逸脱しない範囲の変更は任意に行える。例えば、アース電極3、4が引き出される積層体8の側面は、両側面に限るものではなく、片側側面のみでもよい。その場合、アース電極3、4と接続する外部電極11もまた同様に、積層体8の両側側面に限るものではなく、片側側面のみでもよい。また、外部電極11の数は2本に限らず、少なくとも1本あればよい。

【0013】

20 【発明の効果】以上のように、本発明によれば、アース電極3、4の間の貫通電極を3個以上に増やして電流容量を大きくできると共に、積層型貫通コンデンサの全体としての静電容量が増加しない。従って、大きな電流が流れても異常発熱を抑制できて信頼性を高めることができ、しかも、ノイズフィルタとして高周波領域まで対応できる、積層型貫通コンデンサを提供できる。

【図面の簡単な説明】

【図1】本発明の積層型貫通コンデンサの一実施例に係わる分解斜視図である。

30 【図2】本発明の積層型貫通コンデンサの斜視図である。

【図3】実施例および比較例の発熱特性である。

【図4】従来例の積層型貫通コンデンサの分解斜視図である。

【図5】従来例の積層型貫通コンデンサの斜視図である。

【符号の説明図】

1a、1b、1c・・・貫通電極

3、4・・・アース電極

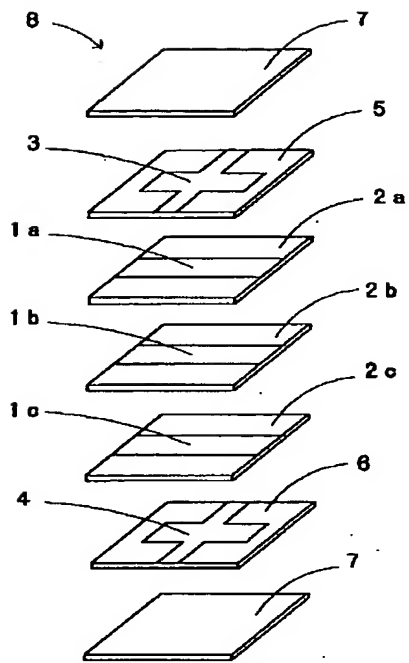
40 2a、2b、2c・・・貫通電極が形成された誘電体シート

5、6・・・アース電極が形成された誘電体シート

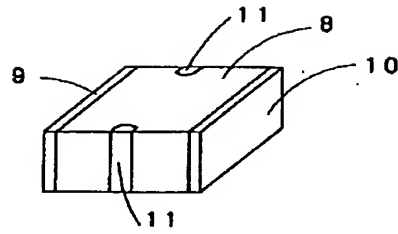
9、10・・・貫通電極と接続する外部電極

11・・・アース電極と接続する外部電極

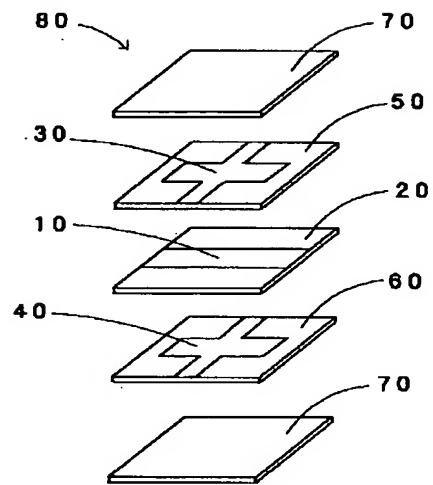
【図1】



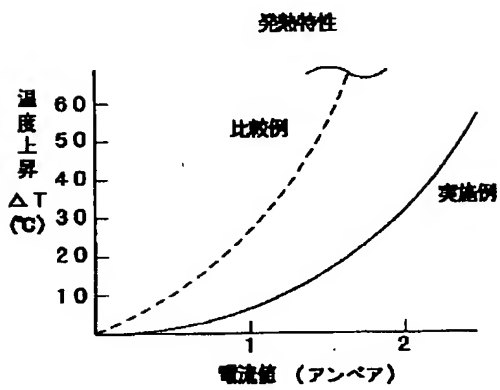
【図2】



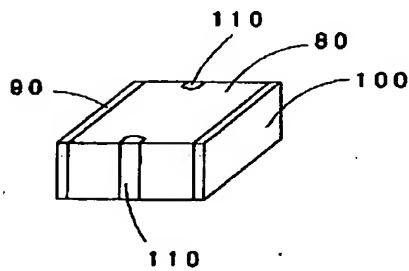
【図4】



【図3】



【図5】



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the laminating mold feedthrough capacitor used for a noise filter etc.

[0002]

[Description of the Prior Art] Drawing 4 and drawing 5 are the decomposition perspective views and perspective views showing an example of the conventional laminating mold feedthrough capacitor. This laminating mold feedthrough capacitor consists of a layered product 80 and an external electrode 90, 100, 110 formed in the outside surface of this layered product 80. While the laminating of the dielectric sheet 20 with which the penetration electrode 10 was formed, and the dielectric sheets 50 and 60 with which the ground electrodes 30 and 40 were formed in the dielectric sheet 20 top and bottom is carried out, as for the layered product 80, the laminating of the dielectric sheet 70 for outer layers is carried out to the outside of the dielectric sheets 50 and 60, respectively. Moreover, said penetration electrode 10 is pulled out by the both-ends side of a layered product 80, and said ground electrodes 30 and 40 are pulled out by the both-sides side between both ends and the side. Said ground electrodes 30 and 40 are connected with the external electrode 90, 100 for said penetration electrode 10 again at the external electrodes 110 and 110, respectively. Here, the laminating mold feedthrough capacitor shown in drawing 4 and drawing 5 since electrostatic capacity is formed between each of the above-mentioned penetration electrode 10, the ground electrode 30, and the penetration electrode 10 and the ground electrode 40 is the noise filter of the penetration mold by which the electrostatic capacity of two pieces was mutually connected to juxtaposition.

[0003] Moreover, there are some which made two-layer the penetration electrode 10 among the ground electrodes 30 and 40 as a laminating mold feedthrough capacitor by which the same electrostatic capacity of two pieces as the above was mutually connected to juxtaposition. This is for making the resistance of the penetration electrode as the whole small, and enlarging current capacity by connecting two penetration electrodes 10 to juxtaposition between the external electrodes 90, 100.

[0004] However, the thickness of such a penetration electrode 10 was as thin as several micrometers, and since resistance was high, when this was used for noise filters, such as power-source Rhine, and the big current flowed, the problem on which the penetration electrode 10 carries out abnormality generation of heat, the electrical property of a laminating mold feedthrough capacitor is changed sharply, it separates greatly from a desired property, and a crack etc. goes into the body of a laminating mold feedthrough capacitor usually had it.

[0005]

[Problem(s) to be Solved by the Invention] Then, although it is possible to increase the number of penetration electrodes further, to make the resistance of the penetration electrode as the whole small, and to enlarge current capacity, it combines with the penetration electrode increased in this case, and since the ground electrode which forms electrostatic capacity between that penetration electrode will also be increased, also in electrostatic capacity, three or more pieces will be connected to juxtaposition, and the whole electrostatic capacity will become large. The laminating mold feedthrough capacitor with such large electrostatic capacity stops being able to respond easily to a RF field as a noise filter.

[0006] This invention is made that the above-mentioned problem in the conventional penetration mold multilayer capacitor should be solved, and it aims at offering the laminating mold feedthrough capacitor with which electrostatic capacity does not become large while increasing the number of penetration electrodes and being able to enlarge current capacity.

[0007]

It is means] in order to solve [technical problem. The layered product by which this invention has a penetration electrode and the ground electrode by which the laminating was carried out to this penetration electrode top and bottom

inside, and said penetration electrode was pulled out by both ends, and said ground electrode was pulled out by the side face between those both ends, In the laminating mold feedthrough capacitor which consists of two or more external electrodes connected and formed in each of said penetration electrode pulled out by the both-ends side and side face of said layered product, and said ground electrode Said penetration electrode is a laminating mold feedthrough capacitor characterized by carrying out the laminating between said ground electrodes as at least three pieces overlap. Since according to this this invention a laminating is carried out between ground electrodes as at least three penetration electrodes overlap, and each penetration electrode is mutually connected to juxtaposition with an external electrode, if a penetration electrode is increased to three or more pieces, the resistance of the penetration electrode as the whole will be made smaller, and current capacity can be enlarged. Moreover, the penetration electrode which whose penetration electrodes with which electrostatic capacity is formed between ground electrodes are only two penetration electrodes of the outside of the penetration electrode which counters with a ground electrode, i.e., a penetration electrode, and exists between them is not contributed to formation of electrostatic capacity. For this reason, even if it increases that penetration electrode to three or more pieces, the electrostatic capacity as the whole does not increase only by the penetration electrodes which are not contributed to formation of electrostatic capacity increasing in number.

[0008]

[Embodiment of the Invention] Hereafter, the example of this invention is explained based on a drawing.

[0009] Drawing 1 is a decomposition perspective view concerning one example of the laminating mold feedthrough capacitor of this invention. Drawing 2 is the perspective view showing the appearance of the laminating mold feedthrough capacitor of this invention. The laminating mold feedthrough capacitor of this example consists of a layered product 8 and external electrodes 9, 10, and 11 formed in the outside surface of this layered product 8. Dielectric sheet 2a in which, as for the layered product 8, the penetration electrodes 1a, 1b, and 1c were formed, As 2b and three 2c overlap, while a laminating is carried out and the laminating of the dielectric sheets 5 and 6 with which the ground electrodes 3 and 4 were formed in the dielectric sheet 2a top and the dielectric sheet 2c bottom is carried out The laminating of the dielectric sheet 7 for outer layers is carried out to the outside of the dielectric sheets 5 and 6, respectively. Moreover, said penetration electrodes 1a, 1b, and 1c are pulled out by the both-ends side of a layered product 8, and said ground electrodes 3 and 4 are pulled out by the both-sides side between both ends and the side. Said ground electrodes 3 and 4 are connected with the external electrodes 9 and 10 for said penetration electrode 1 again at the external electrodes 11 and 11, respectively. Moreover, although, as for the above-mentioned example, the three-sheet laminating of the dielectric sheet with which the penetration electrode was formed among the dielectric sheets 5 and 6 with which the ground electrodes 3 and 4 were formed is carried out, the thing of not only three sheets but four sheets or more may be used, namely, the laminating mold feedthrough capacitor of this invention should just have at least three penetration electrodes among the ground electrodes 3 and 4.

[0010] This invention is the laminating mold feedthrough capacitor with which they were formed among the ground electrodes 3 and 4 as mentioned above as at least three penetration electrodes overlapped, since each penetration electrode is mutually connected to juxtaposition with an external electrode, makes the resistance of the penetration electrode as the whole smaller, and can enlarge current capacity. Moreover, since the lap area between the ground electrodes 3 and 4 and each penetration electrode does not increase even if it increases a penetration electrode to three or more pieces, the electrostatic capacity as the whole does not increase. Next, in order to check the effectiveness of the laminating mold feedthrough capacitor of this invention, the laminating mold feedthrough capacitor which carried out the laminating of the size of a penetration mold multilayer capacitor among the ground electrodes 3 and 4 by L suns 3.2mm, W suns 1.25mm, and T suns 0.8mm as overlapped eight penetration electrodes was produced. The laminating mold feedthrough capacitor which carried out the laminating of said penetration electrode among the ground electrodes 3 and 4 as an example of a comparison as overlapped two sheets was produced. And as a result of measuring the resistance of the penetration electrode as the whole laminating mold feedthrough capacitor, in the example, in 30 milli ohms and the example of a comparison, it became 130 milli ohms and about 1/4 of resistance of an example became small 4 compared with the example of a comparison. Moreover, as a result of measuring the electrostatic capacity as the whole laminating mold feedthrough capacitor, in the example, in 2000pF and the example of a comparison, it was set to 1950pF and the electrostatic capacity of an example became the almost same value as the example of a comparison. Next, in order to see the magnitude of current capacity, the current was passed to the penetration electrode and the temperature rise of the front face of a laminating mold feedthrough capacitor was measured. Consequently, as shown in the heat generation characteristic of drawing 5, although exoergic rise temperature when a 2A current flows was about 28 degrees C in the example, in the example of a comparison, the thermal run away was carried out and it was not able to be measured. Even if current capacity becomes large compared with the example of a comparison and a big current flows in the example from this result, abnormality generation of heat can be controlled. As mentioned above, even if the laminating mold feedthrough capacitor of this example increases the number of penetration electrodes, it can enlarge

current capacity without enlarging electrostatic capacity.

[0011] In addition, even if the difference of an example and the example of a comparison was not accepted, namely, the example increased the number of penetration electrodes compared with the example of a comparison when the insertion-loss property of a laminating mold feedthrough capacitor was measured although detailed explanation was omitted, it checked that an insertion-loss property did not worsen.

[0012] Moreover, a change of the range which does not deviate from the meaning of this invention can be made to arbitration, without restricting this invention to the contents indicated in the above-mentioned example. For example, for the side face of a layered product 8 in which the ground electrodes 3 and 4 are pulled out, it does not restrict to a both-sides side and only a single-sided side face is. In that case, similarly [the external electrode 11 linked to the ground electrodes 3 and 4], it does not restrict to the both-sides side face of a layered product 8, and only a single-sided side face is. Moreover, there should be at least one number of the external electrodes 11 not only in two.

[0013]

[Effect of the Invention] As mentioned above, while according to this invention increasing the penetration electrode between the ground electrodes 3 and 4 to three or more pieces and being able to enlarge current capacity, the electrostatic capacity as the whole laminating mold feedthrough capacitor does not increase. Therefore, even if a big current flows, abnormality generation of heat can be controlled, dependability can be raised, and moreover, the laminating mold feedthrough capacitor which can respond to a high frequency field as a noise filter can be offered.

[Translation done.]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a decomposition perspective view concerning one example of the laminating mold feedthrough capacitor of this invention.

[Drawing 2] It is the perspective view of the laminating mold feedthrough capacitor of this invention.

[Drawing 3] It is the heat generation characteristic of an example and the example of a comparison.

[Drawing 4] It is the decomposition perspective view of the laminating mold feedthrough capacitor of the conventional example.

[Drawing 5] It is the perspective view of the laminating mold feedthrough capacitor of the conventional example.

[The explanatory view of a sign]

1a, 1b, 1c ... Penetration electrode

3 4 ... Ground electrode

2a, 2b, 2c ... Dielectric sheet with which the penetration electrode was formed

5 6 ... Dielectric sheet with which the ground electrode was formed

9 10 ... External electrode linked to a penetration electrode

11 ... External electrode linked to a ground electrode

[Translation done.]